Environmental Monitoring Program
Initial Direction

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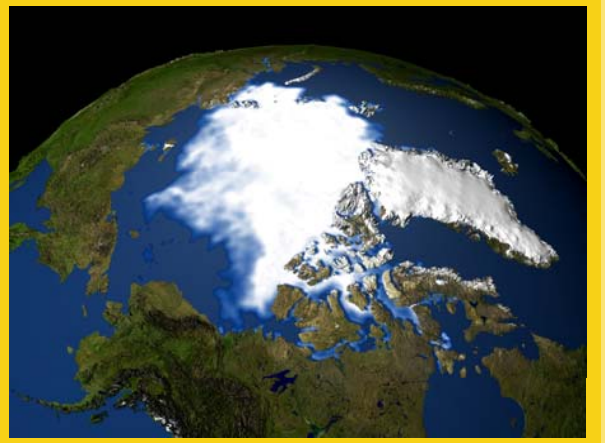


Phase I – Baseline Site Characterization

- Will rely upon baseline characterization from previous five years of study
  - Chukchi Sea Environmental Studies Program (CSESP)
    - 2008 – 2012
    - Physical oceanography, sediment chemistry, benthic communities, plankton communities, and others
  - Chukchi Offshore Monitoring in the Drilling Area (COMIDA)
    - 2010 – 2011
    - Sediment chemistry, benthic community
  - Beaufort studies (Dunton, Trefrey, et al) & CSESP
    - 2008, 2009, & 2011
    - Benthic communities, plankton communities, sediment chemistry, and others
  - 2012 pre-drill evaluation at Burger A
- Historic investigations in both Seas
- Control reference locations during post drill sampling

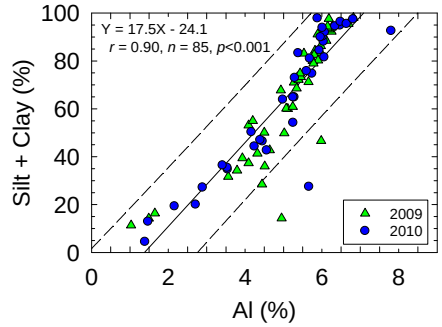
Phase I – Data Available

- Physical Oceanography – currents & water column characteristics
  - Vessel based measurements
    - Currents
    - Water column characteristics
    - Multiple locations within the Burger & Sivuliq prospects
    - Understanding of general (predominant) conditions and extent of variability
  - Oceanographic moorings
  - Drifter buoys & Gliders
  - High Frequency radar

Phase I – Data Available Chemical Data

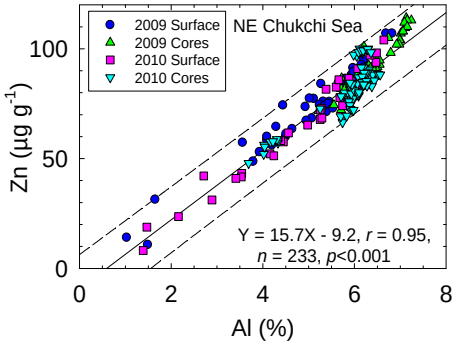
Sample inventory for metals data

Area	Sampled	# of surface sediment samples	# of Biota samples for metals	# of Water samples for metals
Burger A	2012	18	19	0
Other Burger Ref. Sites	2008, 2009	27	21	0
Old Burger Drill Site	2008, 2009	19		
NE Chukchi Sea	2009-2010	58	110	138



Examples of total metal concentrations (dry wt.) for surface sediments

Area	Al (%)	Ba (µg/g)	Pb (µg/g)	Zn (µg/g)
Burger A	6.1 ± 0.2	625 ± 14	13 ± 1	92 ± 5
Other Burger Ref. Sites	5.7 ± 0.9	686 ± 87	12 ± 2	77 ± 16
Old Burger Drill Site	5.6 ± 0.3	851 ± 397	12 ± 2	77 ± 4
NE Chukchi Sea	5.0 ± 1.3	590 ± 62	11 ± 2	71 ± 21



Sediment metal concentrations vary as a function of grain size and clay content (Al is proxy for clay)

Phase I – Benthic data

- Chukchi
  - Total infauna at Burger: 43 unique stations in Burger between the CSESP, COMIDA and Shell DMP studies, 117 total unique stations altogether.
  - Total Epifauna at Burger: 13 stations in Burger, a total of 95 unique stations trawled with COMIDA and CSESP.
  - 33 total video/digital photography surveys
- Beaufort
  - Total infauna at Sivulliq: 27 unique stations in between the CSESP and Shell studies.
  - Total Epifauna at Sivulliq: 7 trawl stations
- Understanding of sediment/biota relationships

Modeling

- SINTEF or similar modeling
  - Dilution
  - Plume
  - Deposition pattern and aerial extent
  - Temperature profile of non-contact cooling water
  - Based upon existing conditions as derived from physical oceanographic information

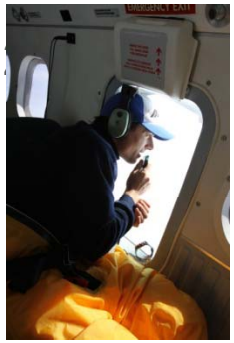
Phase II Effluent Toxicity Characterization

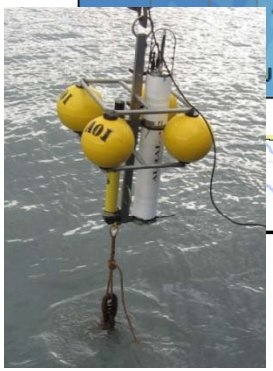
- Applies to the following where they apply
  - Deck drainage, Desalination unit, Boiler blowdown, Fire Control, Non-contact cooling water, Bilge water
- Rapid toxicity testing
  - Microtox or equivalent
  - Definition of “potential toxicity”
    - Will meet existing standards for offshore
- Whole Effluent Toxicity Testing
  - Applicable discharges
    - Show potential toxicity
    - Discharges of > 10,000 gallons and chemicals added
  - Three species chronic short-term testing
  - Challenge will be to meet holding times

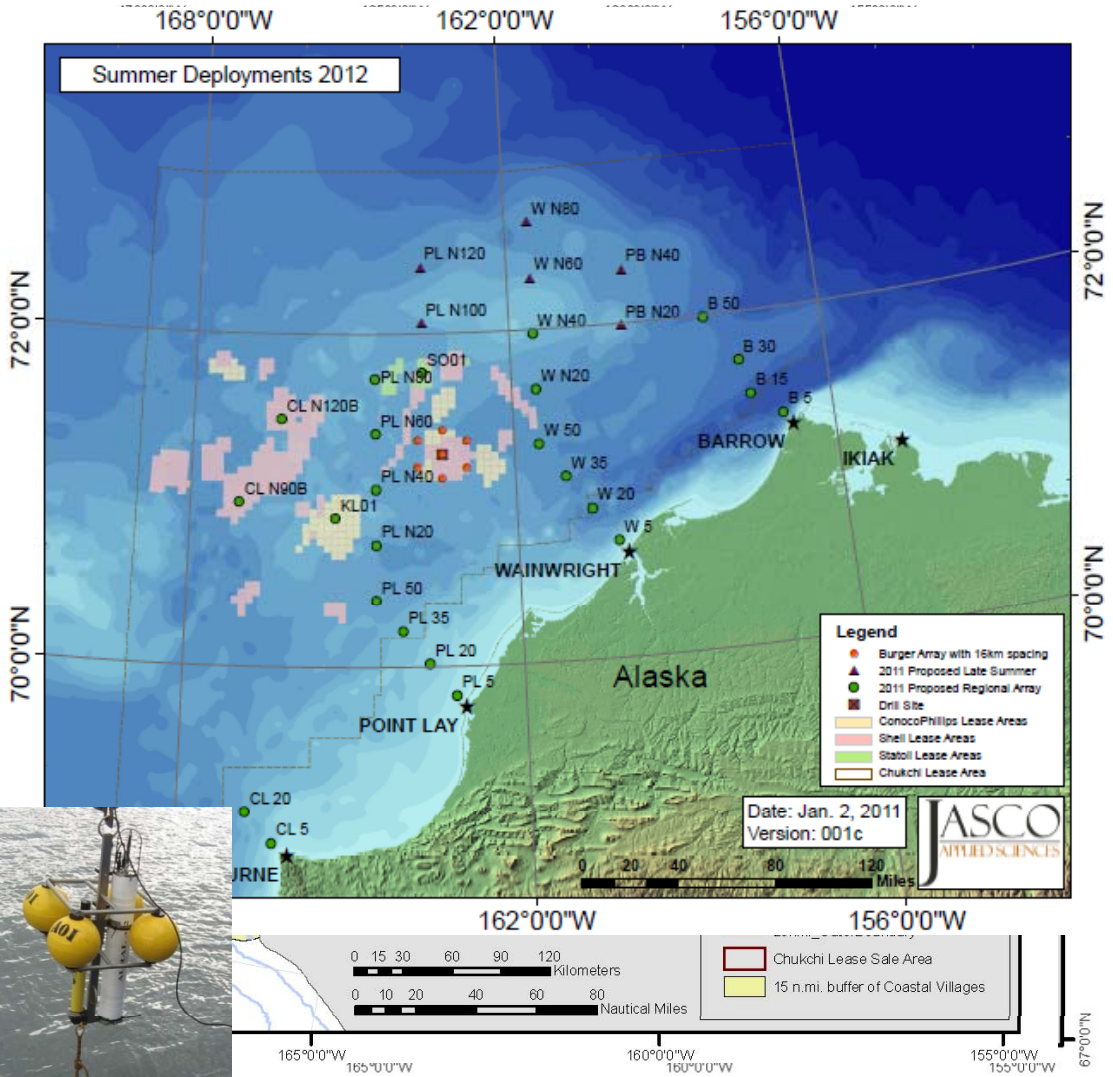
Phase II - Marine Mammal Observations

Triad of Information

- Vessel based observations
  - PSOs on sound source vessels (drill rigs, ice management, anchor handlers)
  - Integrated biologist/local knowledge staff
- Aerial observations
- Acoustics
  - Open water since 2006







Muds & cuttings discharge

- Will include
  - Chemical characterization muds & cuttings
  - Sediment characterization (Phase I, III, & IV)
    - May include substitution of control locations for phase I
  - Benthic community bioaccumulation study
    - May include substitution of control locations for phase I
  - Plume Monitoring
    - Will be conducted either utilizing vessel based monitoring or
    - Automated sampling from moorings (preferred), or
    - AUV sampling (not likely)

Phases III & IV

- Will be accomplished through a integration of targeted sampling and regional programs (CSESP & Beaufort Program)
  - Targeted sampling will provide detailed local assessment
  - Regional programs will provide relevant geographic scale assessments and evaluations
- Will be conducted at sites after well completion and exit of drill rig from the drilling location
- May be impacted by 25 mile air source zone
  - Vessels conducting phase III may not be able to enter the zone
  - Vessels allowed to enter the zone are not suitable for this sampling and are dedicated for other purposes.
- Will utilize long-term after drilling sampling already done.